Assessment of Taphonomic Alterations

1 Scope

This document describes guidelines for assessing taphonomic changes to remains and skeletal material by Anthropology Examiners within the Trace Evidence Unit (TEU).

2 Equipment/Materials/Reagents

- Sliding calipers capable of measuring items up to 200mm within +/- 0.5mm (Mitutoyo Digimatic Absolute Digital Calipers 500-172-20 CD-8”CX or equivalent)
- Spreading calipers capable of measuring items up to 300mm within +/- 0.5mm (Paleo-Tech Digital Linear Spreading Calipers with Mitutoyo Digimatic Absolute Digital Scale 572-213-10 or equivalent)
- Osteometric board (Paleo-Tech Field Osteometric Board, or equivalent)
- Mandibulometer (Paleo-Tech Mandibulometer or equivalent)
- Tape measure
- FORDISC 3.0 or more recent version
- Personal protective equipment (e.g., lab coat, gloves, eye protection)
- Digital radiography unit (NorthStar X-5000 digital radiography unit or Kubtec radiography unit or equivalent)
- Human skeletal reference casts (e.g., complete skeletal reference case, age determination casts)
- Stereobinocular microscope, magnification range from 0.5x to at least 40x
- Reversible adhesive (Paraloid B-72 or equivalent)
- Permanent adhesive (cyanoacrylate or equivalent)
- Digital camera (Nikon D70, or equivalent)

3 Standards and Controls

Not applicable.

4 Sampling

Not applicable.

5 Procedure

The Forensic Anthropological Examinations Procedure will be followed. The assessment of taphonomic alterations may be performed for the purposes of documenting changes to soft tissues and/or skeletal tissues, differentiating taphonomic alterations from antemortem or

perimortem trauma, and estimating the postmortem interval (PMI).

Any referenced literature will be cited in the case notes. Appropriate reference literature includes relevant studies appearing in peer-reviewed journals or edited volumes and texts. Skeletal reference material includes bones, bone replicas, and bone casts produced or used for the purpose of skeletal examination and comparison.

5.1 Procedure for Assessing Soft Tissue Taphonomic Alterations

Following death, cellular and microbial processes (autolysis and putrefaction) result in changes to and reduction of soft (i.e., non-skeletal) tissues of the body. Examinations of soft tissues may include visual, microscopic, and/or radiologic analysis.

Relevant information regarding the condition of soft tissues may include:

- Presence/absence of tissue
- Presence/absence of associated odor
- Color
- Distribution of tissue
- Bloating
- Marbling
- Skin slippage
- Mummification
- Saponification

In some cases, the condition of soft tissues may be scored according to published classification systems.

5.2 Procedure for Assessing Skeletal Taphonomic Alterations

Skeletal tissues are subject to modification by factors in the depositional environment. Relevant information regarding the condition of skeletal tissue may include:

- Well preserved/poorly preserved
- Staining/color
- Root presence/etching
- Weathering (e.g., bleaching, cracking, flaking, warping, erosion)
- Scavenging (e.g., disarticulation, missing bone, pitting, scoring, striations). In some cases, certain modifications can be associated to a particular scavenging group (e.g., carnivore, rodent).

5.3 Procedure for Postmortem Interval Estimation

Postmortem interval estimation is typically based on the degree of soft tissue and/or skeletal taphonomic alteration, often combined with knowledge of the depositional environment, and usually derived from case study analyses and climate-specific research. In many cases, these estimates are qualitative and broad. In some cases, scoring systems and associated formula(e) may be used. The method used, scores, and calculations will be recorded in the case notes.

5.4 Records

5.4.1 Case Notes

Case notes will include any significant observations leading to conclusions regarding the source/mechanism of a particular taphonomic observation, such as descriptive text, photographs, diagrams, printouts (e.g., FORDISC results), and radiologic images. Descriptions will include the location and characteristics of taphonomic alterations using anatomical terms and measurements, where applicable. In cases involving PMI estimation, notes will include the method(s) selected, as applicable, the estimate, the standard used, the prediction interval, the phase or category observed, the standard error/standard deviation, and models, exemplars or reference literature used. Supporting records and raw data will also be included with the case notes. Reasons for not providing a requested estimate will be recorded *(*e.g., insufficient/lack of material present).

5.4.2 Reports

Based on the examination request and at the discretion of the examiner, the final FBI Laboratory Report (7-1, 7-1 LIMS) will include, where relevant, descriptions of taphonomic alterations, their sources, and their implications for the postmortem interval. Where possible, the accuracy of the postmortem interval estimate based on the method used will be provided.

5.4.2.1 *Laboratory Reports* on the assessment of soft tissue alterations will include a description of quantity and/or quality. For example: "*Soft tissues are absent*" OR "*Adhering desiccated soft tissue is present*."

5.4.2.2 *Laboratory Reports* on the assessment of skeletal tissue alteration will include a description of quantity and/or quality as well as the source of the alteration where possible. For example: "*Missing bone and striations are consistent with rodent gnawing"* OR "*The bone is weathered, including bleaching and exfoliation."*

5.4.2.3 *Laboratory Reports* on the estimation of postmortem interval will include the estimate and prediction interval where possible. For example: "*The postmortem interval is approximately 6-12 months"* OR "*The postmortem interval is greater than one year."*

6 Calculations

Calculations carried out as part of a biological profile or postmortem interval will be performed according to appropriate reference data.

Calculations may be carried out in accordance with the prescribed method in the reference literature, or through the use of FORDISC. The source(s) of the formula(e) and calculations used will be documented in the case notes.

7 Measurement Uncertainty

The measurement uncertainty with calipers is approximately ± 0.02 mm or better, depending on the calipers used. Refer to instrument manuals for uncertainty for a particular caliper. This degree of uncertainty of measurement does not significantly affect anthropological conclusions and is not detrimental to the results of anthropological examinations.

8 Limitations

The conclusions that can be reached from anthropological examinations assessing taphonomic alterations are dependent on the condition and completeness of the remains, as well as knowledge of the depositional environment. Results based on fragmentary or poorly preserved material or limited information on the depositional environment may be inconclusive.

Due to the number variables that affect postmortem tissue changes, the postmortem interval provided is an estimate. With increasing length of the postmortem interval, fewer methods are available and are typically less precise.

9 Safety

9.1 While working with physical evidence, Laboratory personnel will wear at least the minimum appropriate protective attire (e.g., laboratory coat, safety glasses, protective gloves).

9.2 Universal precautions will be followed.

9.3 Exposure to biological and radiological hazards may be associated with the examination techniques performed. Safety procedures related to specific instruments or equipment (e.g., wafering saws, X-ray units) will be followed. Refer to the FBI Laboratory Safety Manual for guidance.

10 References

- FBI Laboratory Safety Manual (current version)
- Megyesi MS, Nawrocki SP, Haskell NH. Using accumulated degree-days to estimate the postmortem interval from decomposed human remains. Journal of Forensic Sciences 2005; 50(3):1-9.
- Scientific Working Group for Forensic Anthropology guidelines for Taphonomic Observations in the Postmortem Interval (current version).
- Scientific Working Group for Forensic Anthropology guidelines for Trauma Analysis (current version).
- Forensic Anthropological Examinations, Trace Evidence Procedures Manual

(current version)

Rev. #	Issue Date	History
0	02/07/2018	Original issue.
1	02/10/2020	Changed ‘forensic anthropologist’ to ‘Anthropology Examiner’ in Scope and ‘examiner’ throughout. Removed ‘Sample Selection’ from Section 4 title. Updated Fordisc to FORDISC throughout for consistency. Updated examples for Section 5.2 Scavenging.

Approval

Redacted - Signatures on File

Trace Evidence Unit Chief — Date: 02/07/2020

Anthropology Technical Leader — Date: 02/07/2020